AN OVERVIEW OF THE US DoD INDIVIDUAL PROTECTION TECH BASE PROGRAM

Tony Ramey

Program Manager for Protection
Naval Surface Warfare Center, Panama City
(850)235-5287 or
DSN 436-5287
rameyra@ncsc.navy.mil

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INDIVIDUAL PROTECTION
Investment Rationale

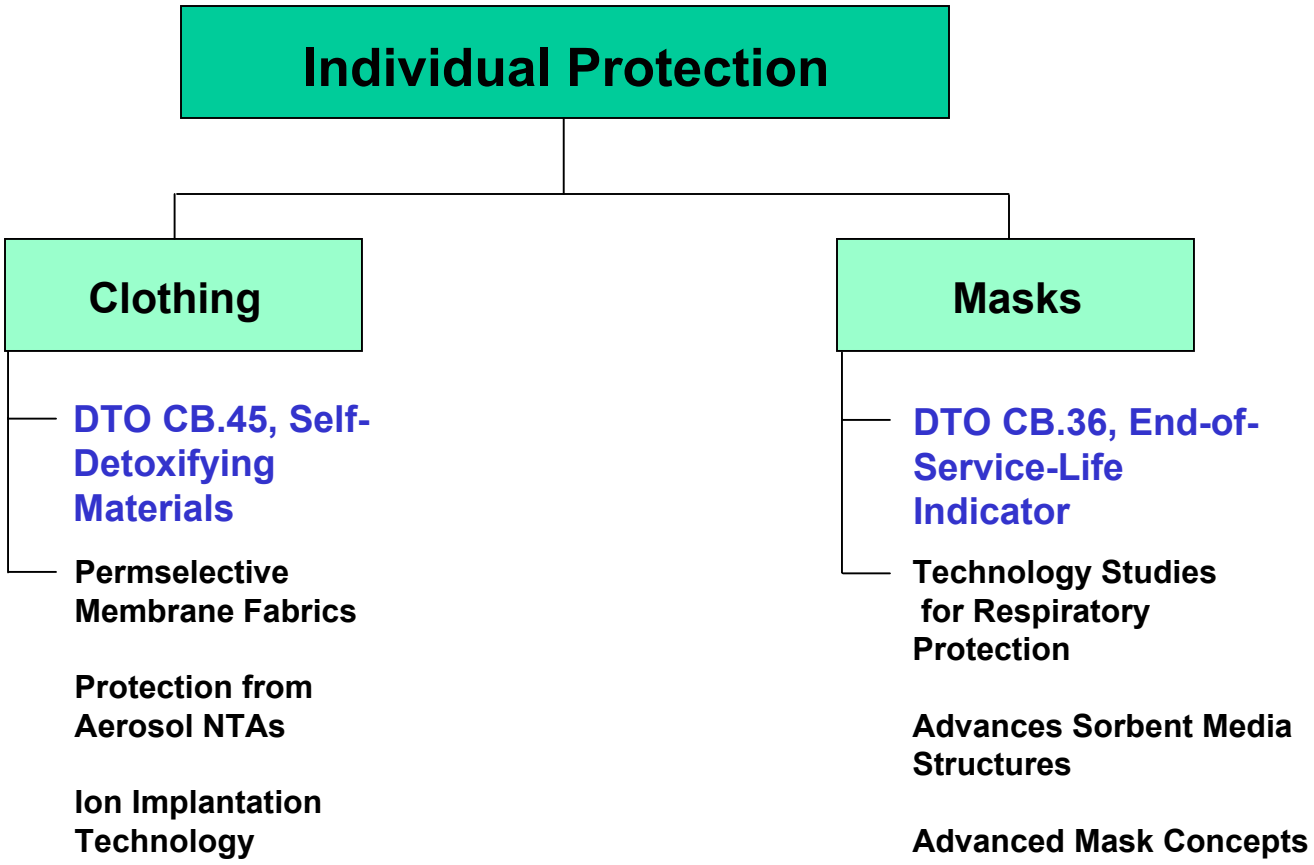
<u>Rationale for Investment:</u> The warfighter cannot always avoid a CBRN contaminated environment, thus, he needs the ability to perform his assigned mission at near-normal tempo in that environment.

<u>Statement of Objectives:</u>

- **Minimize mission degradation by reducing the effects of the use of individual protection on the warfighter's performance**
- **Improve protection against current threats**
- **Add protection to address all potential threats**
- **Reduce logistics burden**

INDIVIDUAL PROTECTION

Taxonomy

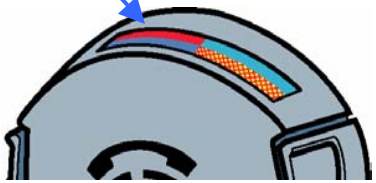


INDIVIDUAL PROTECTION

Mask Operational Context

Advanced lens system with improved vision, field-of-view, chemical resistance, and durability. (JFOC)

ESLI with improved user confidence and safety and reduced logistics. (JSGPM & JFOC)



Next generation mask system with improved protection, reduced weight and bulk, reduced thermal burden, and improved system integration. (JFOC)

Advanced filter system with improved protection and reduced breathing resistance. (JFOC)

INDIVIDUAL PROTECTION

Mask Technology Needs

Technologies to remove the remaining TIMs and NTAs

Technologies to further reduce breathing resistance

Filters that are long-life, regenerable, or non-depleting

Sensors that indicate when TIM protection is no longer provided

Sensors that indicate when mask leakage is occurring

Advanced materials and designs that further enhance communications with individuals and interface with equipment.

INDIVIDUAL PROTECTION

Mask Technology Transitions

Mature Devt Program	Candidate Technologies (TRL)	Potential FY 6.4 transition	Major element of tech risk
Joint Service General Purpose Mask (JSGPM)	End-of-Service-Life Indicator (3)	FY05	Sensitivity to a broad range of CWA's Environmental stability Battlefield Interferrents
Next Generation General Purpose Mask (NGGPM) Next Generation Aircrew Mask (NGAM)	Advanced Mask Concepts (2) Novel Sorbent Media Structures (2) Advanced Lens Materials (2) Supporting technologies (2)	FY10 FY12	Balance of increased protection, reduced breathing resistance, and improved interface with reduced weight and bulk

INDIVIDUAL PROTECTION

Clothing Operational Context

Improved system integration with suit, mask, helmet, gloves, boots, body armor, weapons, etc. (JFOC)

Reactive clothing materials with increased protection, reduced doffing hazard, and reduced logistics burden. (JFOC)

Cool, lightweight CB duty uniform based on nanofiber or membrane technology with increased mission duration and a reduced logistics burden. (JSLIST/JFOC)

INDIVIDUAL PROTECTION
Clothing Technology Needs

Technologies to address remaining TIMs and NTAs

Advanced materials to further reduce reduce thermal load

Technologies that provide a more durable garment system

Sensor that provides an indication when protection is lost

Materials for reducing garment weight and bulk

Advanced materials and designs that improve interface with other mission equipment

INDIVIDUAL PROTECTION
Clothing Technology Transitions

Mature Devt Program	Candidate Technologies (TRL)	Potential FY 6.4 transition	Major element of tech risk
Joint Service Lightweight Integrated Suit Technology (JSLIST) Block II Upgrade	Self-Detoxifying Materials (3)	FY10	Identify stable, broad spectrum, fast acting catalysts
Joint Service Lightweight Integrated Suit Technology (JSLIST) Block I Upgrade	Individual Protection from Aerosols (3)	FY06	Durability of the technology Selecting technologies for fielded garments
Joint Service Lightweight Integrated Suit Technology (JSLIST) Block II Upgrade	Optimized perm-selective membranes (2)	FY10	Improving protection without increasing garment weight or thermal load

Individual Protection
DTO CB.36 End-of-Service-Life Indicator for NBC Mask Filters

Objective: To develop a low-cost, qualitative, end-of-service-life indicator (ESLI) for use in NBC mask filters capable of detecting the presence of a wide range of chemical warfare agents (CWAs).

Description of Effort: Colorimetric indicator film technology is being investigated to develop a multi-gas ESLI for CWAs. These thin-film products are coated with pH sensitive dyes and reagents that target common functional groups and/or chemical properties of the major classes of CWAs. Lead candidates are specially formulated to detect acid gases and acidic vapor by-products caused by the hydrolysis of nerve and blister agents. The approach is to incorporate the ESLI films along the inside wall of the filter next to the carbon bed so that they will react with the passing vapor wave front. A transparent window will be used to view distinctive color pattern change.

Benefit to Warfighter: DTO supports QDR Transformation Operational Goals by increasing warfighter readiness and survivability through improved protection and sustainment. Also addresses JFOC goals for unlimited respiratory protection. ESLI will provide an objective means to determine optimum time to replace filter, thereby increasing user safety and confidence in protective mask.

Challenges:

- Optimize sensitivity and placement of indicators to target a wide range of CWAs
- Environmental stability (i.e., minimize effects of interferents and temperature and humidity extremes to prolong use and storage life)
- Manufacturability (i.e., ease of integration)

Major Goals/Milestones:

FY04
- Fabricate and test ESLI filter concept model for key agents
- Evaluate effects of environmental factors (heat & humidity) and long-term storage on ESLI filter concept model

FY05
- Assess the effects of common battlefield interferrents on ESLI performance
- Optimize ESLI design and conduct demonstration testing of ESLI filter prototypes
- Investigate new indicators to detect battlefield interferrents

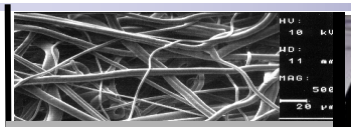
POC: Paul Gardner, US Army ECBC, paul.gardner2@us.army.mil, DSN 584-6692

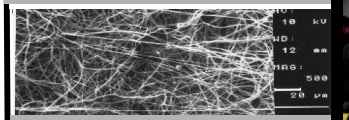
DTO CB.45: Self-Detoxifying Materials for CB Protective Clothing

Objective:
Demonstrate lightweight, self-detoxifying CB protective clothing

Description of Effort:
Incorporate agent reactive catalysts and biocides into CB protective fabric systems.
Demonstrate the effectiveness of incorporated catalysts and biocides to neutralize CB agents

Supports Joint Future Operational Capability 3.3.3.2 – Unlimited Percutaneous Protection.


Meltblown Liner


Electrospun Layer


Reactive Shell


Multi-Layered Garment Manufacturing Concept

Benefit to warfighter:
Increased protection.
In-situ neutralization of CB agents.
Reduced hazard during doffing and disposal.
Reduced logistics burden.

Challenges:
Identify agent reactive catalysts which are effective in neutralizing more than one specific type of agent.
Identify fiber and film supported catalysts and biocides which act rapidly against vapor and liquid challenges.
Balance increased protection vs. weight.
Add self-detoxifying capability while minimizing additional cost of fabrics/treatments.
Meet catalyst durability and stability needs for clothing.

Major goals/milestones by FY:
FY04: Demonstrate surface decon levels of 2mg/cm^2/day.
Downselect most promising technologies
FY05: Demonstrate reactivity stability (time, temp., use)
Optimize materials for reactivity and stability
Integrate technologies from DARPA, SBIRs, etc.
FY06: Fabricate 1st prototype garment
Conduct both simulant and agent testing of garment
Conduct field testing of self-detox fabric garment
FY07: Design and manufacture optimized garment
Demonstrate optimized garment

PI contact info: Dr. Heidi Gibson, Natick Soldier Center, 508-233-5487, DSN 256-, Heidi.Gibson@natick.army.mil

Leveraging of Non-CBDP Efforts

Thrust	Known OGA efforts	Extent of leveraging
Masks	ARL (Nanomaterials) ARO (Sorbents) NIOSH (Masks) AMC SBIRs (ESLI) ($0.6M) DARPA (Sorbents) USAF SBIR (Nanocomposites)	Information exchange Information exchange Information exchange Oversight Information exchange Information exchange
Clothing	NRL (Electrospun Enzymes) DARPA (Membranes)($2.7M) Idaho National Environmental Lab AMC SBIRs (Reactive Materials) AF SBIRs (Reactive Materials) ($0.6) ARO STTR-TDA, MURI-UPITT ISN at MIT	Information exchange Direct participation Information exchange Oversight Direct participation Information exchange Information exchange
Masks and Clothing	Objective Force Warrior UK, Canada, Australia, Israel, Netherlands	Direct participation TTCP-Information exchange DEA-Information exchange